Available online at www.sciencedirect.com
SCIENCE DIRECT®
ELSEVIER
Nuclear Instruments and Methods in Physics Research A 542 (2005) xxvii–xxx
NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH Section A
www.elsevier.com/locate/nima

Contents

ITMNR-5
Proceedings of the Fifth International Topical Meeting
on Neutron Radiography
Garching, Germany, July 26–30, 2004

Editors: T. Bücherl, B. Schillinger, A. Türler, P. Böni

Editorial vii
Committee ix
List of participants x
Conference photo xxvi

Section 1. New Facilities and Facility Design

Characteristics of the neutron/X-ray tomography system at the SANRAD facility in South Africa
F.C. de Beer 1

New neutron imaging facility at the NIST
D.S. Hussey, D.L. Jacobson, M. Arif, P.R. Huffman, R.E. Williams and J.C. Cook 9

Industrial applications at the new cold neutron radiography and tomography facility of the HMI
N. Kardjilov, A. Hilger, I. Manke, M. Strobl, W. Treimer and J. Banhart 16

Neutron-, gamma- and X-ray three-dimensional computed tomography at the Budapest research reactor site
M. Balaskó, A. Kuba, A. Nagy, Z. Kiss, L. Rodek and L. Ruskó 22

LENS—a pulsed neutron source for education and research
D.V. Baxter, J.M. Cameron, M.B. Leuschner, H.O. Meyer, H. Nann and W.M. Snow. 28

Conceptual monochromatic digital neutron radiography using continuous cold neutron beam
M. Tamaki 32

Construction and assembly of the neutron radiography and tomography facility ANTARES at FRM II
E. Calzada, B. Schillinger and F. Grünauer 38

Section 2. Radiographic Applications

Classification of defects in honeycomb composite structure of helicopter rotor blades
M. Balaskó, E. Sváb, Gy. Molnár and I. Veres 45

An on-line study of fuel cell behavior by thermal neutrons
D. Kramer, E. Lehmann, G. Frei, P. Vontobel, A. Wokaun and G.G. Scherer 52

Application of very low energy neutron radiography with energy selection system using 4Qc(4m) supermirror
Y. Kawabata, M. Hino, T. Nakano, H. Sunohara, U. Matsushima and P. Geltenbort 61

doi:10.1016/S0168-9002(05)00693-5

Non-invasive studies of objects from cultural heritage
E.H. Lehmann, P. Vontobel, E. Deschler-Erb and M. Soares 68

Measurement of changes in water thickness in plant materials using very low-energy neutron radiography
U. Matsushima, Y. Kawabata, M. Hino, P. Geltenbort and B.M. Nicolaï 76

Neutron-induced electron radiography
R. Pugliesi, M.L.G. Andrade, M.A.S. Pereira and F. Pugliesi 81

Neutron radiography as visualization and quantification method for conservation measures of wood firmness enhancement
E. Lehmann, S. Hartmann and P. Wyer 87

Section 3. Phase Contrast Imaging with Neutrons

Non-destructive testing with neutron phase contrast imaging
E. Lehmann, K. Lorenz, E. Steichele and P. Vontobel 95

Improving the image contrast and resolution in the phase-contrast neutron radiography
N. Kardjilov, S.W. Lee, E. Lehmann, I.C. Lim, C.M. Sim and P. Vontobel 100

Neutron imaging of fiber-reinforced materials
M. Bastürk, N. Kardjilov, H. Rauch and P. Vontobel 106

Section 4. Continuous Radiography and Stroboscopic Imaging

High flux neutron imaging for high-speed radiography, dynamic tomography and strongly absorbing materials
A. Hillenbach, M. Engelhardt, H. Abele and R. Gähler 116

Characterization of the image quality in neutron radioscopy
J. Brunner, M. Engelhardt, G. Frei, A. Gildemeister, E. Lehmann, A. Hillenbach and B. Schillinger 123

Visualization of cavitation phenomena in a Diesel engine fuel injection nozzle by neutron radiography
N. Takenaka, T. Kadowaki, Y. Kawabata, I.C. Lim and C.M. Sim 129

Study of water distribution and transport in a polymer electrolyte fuel cell using neutron imaging
N. Pekula, K. Heller, P.A. Chuang, A. Turhan, M.M. Mench, J.S. Brenizer and K. Ünlü 134

Detection systems for short-time stroboscopic neutron imaging and measurements on a rotating engine
B. Schillinger, H. Abele, J. Brunner, G. Frei, R. Gähler, A. Gildemeister, A. Hillenbach, E. Lehmann and P. Vontobel 142

Dynamic imaging with a triggered and intensified CCD camera system in a high-intensity neutron beam
P. Vontobel, G. Frei, J. Brunner, A.E. Gildemeister and M. Engelhardt 148

Visualization and void fraction distribution of downward gas–liquid two-phase flow in a plate heat exchanger by neutron radiography
H. Asano, N. Takenaka, T. Wakabayashi and T. Fujii 154

Visualization of fluidized-bed heat exchanger in upward/downward flow condition by neutron radiography
S. Furui, H. Umekawa, M. Tsuzuki, M. Okura, M. Ozawa and N. Takenaka 161

Application of high frame-rate neutron radiography to liquid-metal two-phase flow research
Y. Saito, K. Mishima, Y. Tobita, T. Suzuki, M. Matsubayashi, I.C. Lim and J.E. Cha 168

Observation of the two-phase flow patterns for a finned assembly using neutron radiography
J.E. Cha, I.C. Lim, C.M. Sim, I.C. Chu, Y.S. Choi, Y. Saito and B.J. Jun 175

Measurement of the void fraction in a channel simulating the HANARO fuel assembly using neutron radiography
I.C. Lim, C.M. Sim, J.E. Cha, Y.S. Choi, N. Takenaka, Y. Saito and B.J. Jun 181

Section 5. Fast Neutrons

CCD detectors for fast neutron radiography and tomography with a cone beam
E. Bogolubov, O. Bugaenko, S. Kuzin, V. Mikerov, E. Monitch, A. Monitch and A. Pertsov 187

Detectors based on imaging plates for fast neutron radiography
V. Mikerov, V. Samosyuk and S. Verushkin 192

Detectors for time-of-flight fast-neutron radiography 1. Neutron-counting gas detector
V. Dangendorf, G. Laczko, M. Reginatto, D. Vartsky, M. Goldberg, I. Mor, A. Breskin and R. Chechik . 197

Time-resolved fast neutron imaging: simulation of detector performance
D. Vartsky, I. Mor, M.B. Goldberg, I. Mardor, G. Feldman, D. Bar, A. Shor, V. Dangendorf, G. Laczko, A. Breskin and R. Chechik 206

Section 6. Poster Presentations

Implementation of neutron tomography around the Algerian Es-Salam research reactor: preliminary studies and first steps
F. Kharfi, L. Boukerdja, A. Attari, M. Abbaci and A. Boucenna 213

Quantitative measurement of segregation phenomena in a binary-mixture fluidized bed by neutron radiography
H. Umekawa, S. Furui, Y. Oshima, M. Okura, M. Ozawa and N. Takenaka 219

Testing the durability of concrete with neutron radiography
F.C. de Beer, J.J. le Roux and E.P. Kearsley 226

Dynamic neutron radiography observations of water migration in porous media
J.J. Milczarek, A. Czachor, A. El-Ghany El Abd and Z. Wiśniewski. 232

Monte Carlo code for neutron radiography
J.J. Milczarek, A. Trzciński, A. El-Ghany El Abd and A. Czachor 237

Visualization of the hygroscopic water distribution in an adsorbent bed by neutron radiography
H. Asano, T. Nakajima, N. Takenaka and T. Fujii 241

Characterization of a focusing parabolic guide using neutron radiography method
N. Kardjilov, P. Böni, A. Hilger, M. Strobl and W. Treimer 248

The performance of an amorphous silicon flat panel for neutron imaging at the PSI NEUTRA facility
M. Estermann, G. Frei, E. Lehmann and P. Vontobel 253

Computer tomography thermometry—an application of neutron resonance absorption spectroscopy
T. Kamiyama, J. Ito, H. Noda, H. Iwasa, Y. Kiyanagi and S. Ikeda 258

CNR—the new beamline for cold neutron imaging at the Swiss spallation neutron source SINQ
G. Kühne, G. Frei, E. Lehmann and P. Vontobel 264

Design of a prototype microchannel plate detector with cooled amorphous silicon array readout for neutron radiography
R.M. Ambrosi, G.W. Fraser, R.A. Street, J.I.W. Watterson, R.C. Lanza, J. Dowson, A.F. Abbey, B. Feller, G. Downing, P. White and T. Stevenson 271

Neutron and synchrotron radiation tomography: New tools for materials science at the GKSS-Research Center
F. Beckmann, J. Vollbrandt, T. Donath, H.W. Schmitz and A. Schreyer 279

Performance of a pixel detector suited for slow neutrons
J. Uher, T. Holý, J. Jakůbek, E. Lehmann, S. Pospíšil and J. Vacík 283

The STING imaging system based on using neutrons and gammas
H.B. Barker and M.R. Maier 288

Section 7. Tomographic Applications

Applications of neutron computed tomography in the geosciences
M. Wilding, C.E. Lesher and K. Shields 290

High-speed neutron tomography of dynamic processes
M. Dierick, J. Vlassenbroeck, B. Masschaele, V. Cnudde, L. Van Hoorebeke and A. Hillenbach 296

Pipe corrosion and deposit study using neutron- and gamma- radiation sources
M. Balaskó, E. Sváb, A. Kuba, Z. Kiss, L. Rodek and A. Nagy 302

Section 8. Detection Systems

Development of high-resolution high frame-rate neutron radiography
Y. Saito, K. Mishima, M. Matsubayashi, I.C. Lim, J.E. Cha and C.H. Sim. 309

Images obtained by neutron transmission measurement using time-of-flight method
Y. Kiyanagi, K. Mizukami, T. Kamiyama, F. Hiraga and H. Iwasa 316

Dy-IP characterization and its application for experimental neutron radiography tests under realistic conditions
M. Tamaki, K. Iida, N. Mori, E.H. Lehmann, P. Vontobel and M. Estermann 320

Development of a system for neutron radiography and tomography
M.J. Mühlbauer, E. Calzada and B. Schillinger. 324

Section 9. Software and Methodology for NR and NCT

Database preparation for scattered neutron measurements on radiography
M. Sato, Y. Watanabe and H. Kobayashi 329

Scattering corrections in neutron radiography using point scattered functions
N. Kardjilov, F. de Beer, R. Hassanein, E. Lehmann and P. Vontobel 336

Image deconvolution and coded masks in neutron radiography
F. Grünauer 342

Methods of scattering corrections for quantitative neutron radiography
R. Hassanein, E. Lehmann and P. Vontobel. 353

Neutron CT enhancement by iterative de-blurring of neutron transmission images
B. Masschaele, M. Dierick, L. Van Hoorebeke, P. Jacobs, J. Vlassenbroeck and V. Cnudde 361

Review about old and new imaging signals for neutron computerized tomography
W. Treimer, A. Hilger, N. Kardjilov and M. Strobl. 367

Discrete tomography in neutron radiography
A. Kuba, L. Rodek, Z. Kiss, L. Ruskó, A. Nagy and M. Balaskó 376

Application of refraction contrast tomography
M. Strobl, W. Treimer, N. Kardjilov and A. Hilger. 383

Quantitative CT-reconstruction of void fraction distributions in two-phase flow by neutron radiography
N. Takenaka and H. Asano 387

Application of an iterative artefact reduction method to neutron tomography
S. Kasperl and P. Vontobel. 392

3D computed tomography using a microfocus X-ray source: Analysis of artifact formation in the reconstructed images using simulated as well as experimental projection data
S. Krimmel, J. Stephan and J. Baumann 399

Author index 409